INDIA COUNTRY OFFICE | US CENTERS FOR DISEASE CONTROL AND PREVENTION

ANNUAL REPORT
2015–2016

> *"We must work together to strengthen surveillance to detect emerging diseases, respond to outbreaks, and prevent future pandemics. Through our work together, both nations will benefit as we learn from one another."*
>
> —Richard Verma, US Ambassador to India

CDC India staff gathered at US Embassy New Delhi

FAST FACTS

ESTABLISHED

2001

STAFF

13 US Assignees
37 Locally Employed Staff

FUNDING

FY2016
$30,600,000

OFFICES

Delhi
Hyderabad

PROGRAMS

Division of Global HIV and Tuberculosis

Division of Global Health Protection, Global Disease Detection Regional Center

Influenza Division, including secondee to WHO SEARO

Global Immunization Division, including secondee to WHO SEARO

TABLE OF CONTENTS

LETTER FROM THE DIRECTOR

The CDC India office has made great progress in 2016! This year our work in all areas—Global Health Security, HIV and tuberculosis, influenza, and immunization—has expanded and activities have been scaled to include work across more Indian states than ever before, with more intense efforts at the district level. Our office is collectively managing more than 30 projects, in 24 states, in collaboration with more than 32 Indian government agencies, local health organizations, hospitals, and universities.

In DGHP, the Global Health Security activities have been focused on the "Core 4," that is, expanding surveillance, strengthening laboratory capacity and biorisk management, building the public health workforce, and intensifying emergency management and response. In an essential demonstration of Government of India (GoI) commitment to GHSA, a GHSA "cell" was opened within the Ministry of Health and Family Welfare (MoHFW) and all GHSA activities are now coordinated and overseen through this cell by the Director General of Health Services and the Director General of the Indian Council of Medical Research. Major achievements this year include testing more than 24,000 in-patients with acute fever illness or acute encephalitis syndrome, or both, for a multitude of pathogens. Ultimately, across 14 states of India, only seven pathogens: influenza, malaria, dengue, scrub typhus, leptospira, Japanese encephalitis and Kyasanur Forest Disease comprise more than 85% of patients with a diagnosis. Furthermore, DGHP closely partnered with the government to support a national lab strengthening initiative which will scale up across all states, covering biochemistry, pathology, and microbiology laboratories of district hospital labs and medical college reference labs, and the state public health reference labs. Finally, in collaboration with the government, a robust strategic plan for Workforce Development has been designed, which includes initiating EIS with the WHO Country Office polio transition workforce, initiating EIS and the three-month Frontline Epidemiology training in additional institutions, and with GoI health ministry staff.

Our influenza team has conducted vaccination camps as part of a cllinical trial comparing live attenuated influenza vaccine to inactivated influenza vaccine, and is now collecting follow-up data. These results will help estimate the burden of influenza in the community and effectiveness of available vaccines. The team has generated overall morbidity and mortality burden due to influenza which is crucial not only for informing policy in India but also for estimating the global burden due to influenza. The team is also embarking upon surveillance of a wider range of respiratory pathogens, and studies of influenza in pregnant women and in the elderly, two critically important and vulnerable populations.

DGHT continued a productive partnership with India's National AIDS Control Organization (NACO), providing technical assistance to strengthen both local and national HIV monitoring, care, and treatment mechanisms through funding from the President's Emergency Plan for AIDS Relief (PEPFAR). This year was particularly noteworthy for the HIV prevention activities conducted on behalf of People Who Inject Drugs (PWID) in the Northeastern states of Mizoram, Manipur and Nagaland. This collaboration has had great success in building the effectiveness of NGOs who work with PWIDs and in improving the accessibility of services such as opioid substitution therapy. This year DGHT also accelerated treatment scale up, HIV prevention, and HIV/TB efforts in rigorously selected "cluster districts," six districts in the states of Maharashtra and Andhra Pradesh identified as having high HIV burden and large unmet need. Finally, intense efforts by CDC India and partners were made in Mumbai, and with the Central TB Division, to improve and expand airborne infection control, and expand accessibility to comprehensive diagnosis and programmatic management of drug-resistant TB.

In immunization, CDC India is providing support to scale up measles-rubella vaccination, and is also supporting WHO in strengthening both in-country and cross-border surveillance and disease detection and response. Our collaboration with WHO on training the polio transition staff in EIS will ensure these officers can transition from polio-specific activities to greater public health strengthening.

These achievements are only a beginning, and much remains to be done. I remain grateful for our collaborations with, and trust from, our partners, and inspired by the CDC India team. Despite the challenges we will no doubt encounter, I am confident our dedicated staff and partners will work together to overcome them, and together, we will continue to ensure better public health for India.
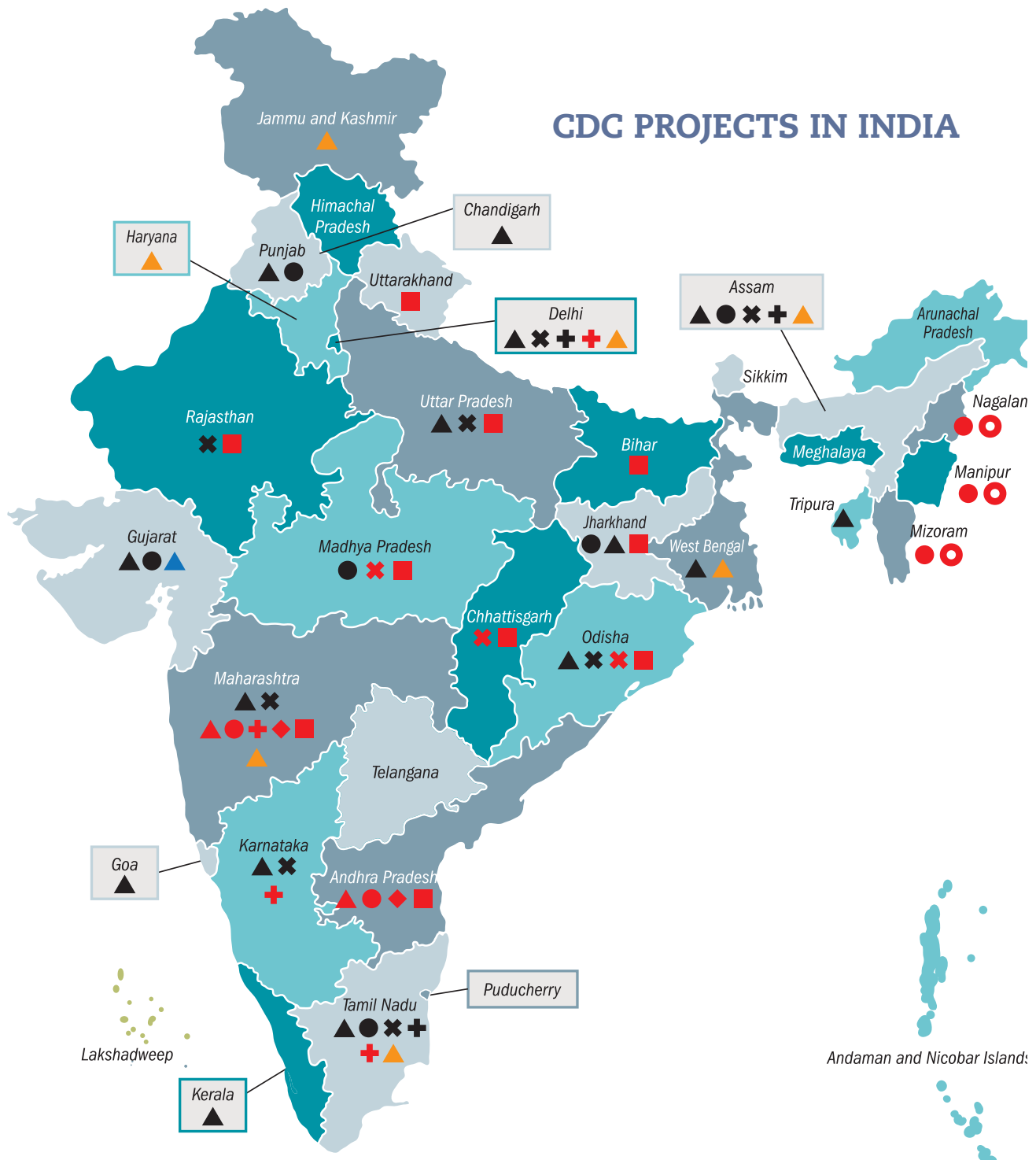
Sincerely,

Dr. Kayla Laserson

KEY PARTNERS

All India Institute of Medical Sciences (AIIMS)

American Society for Microbiology (ASM)

Association of Public Health Laboratories (APHL)

Christian Medical Association of India (CMAI)

FHI360

Health Information Systems Program (HISP)

Indian Council of Medical Research (ICMR)

India HIV/AIDS Alliance

Kalawati Saran Children's Hospital, New Delhi

Integrated Quality Laboratory Service (IQLS)

Manipal University

Ministry of Health and Family Welfare—Central Tuberculosis Division

Ministry of Health and Family Welfare—International Health Division

Ministry of Health and Family Welfare—National AIDS Control Organization

National Centre for Disease Control (NCDC)

National Disaster Management Authority (NDMA)

National Institute of Epidemiology (NIE)

National Institute of Health and Family Welfare (NIHFW)

National Institute of Mental Health and Neurosciences (NIMHANS)

National Institute for Medical Statistics (NIMS)

National Institute for Research in Tuberculosis (NIRT)

National Institute of Tuberculosis and Respiratory Diseases (NITRD)

National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)

National Institute of Virology, Pune (NIV)

National Tuberculosis Institute (NTI)

Public Health Institute (PHI)

SHARE India

Sher-i-Kashmir Institute of Medical Sciences, Srinagar

UNAIDS

University of Washington—I-TECH

Voluntary Health Services

World Health Organization—India Office

World Health Organization—Southeast Asia Regional Office

GLOSSARY OF ACRONYMS

ADD	Acute Diarrheal Diseases
AES	Acute Encephalitis Syndrome
AFI	Acute Febrile Illness
AIC	Airborne Infection Control
AICU	Airborne Infection Control Unit
AIDS	Acquired Immune Deficiency Syndrome
AIIMS	All India Institute of Medical Sciences
AMR	Antimicrobial Resistance
ARI	Acute Respiratory Infection
ART	Antiretroviral Treatment
ATT	Anti-TB Treatment
BRM	Biorisk Management
CBNAAT	Cartridge based nucleic acid amplification test
CDC	United States Centers for Disease Control and Prevention
CLABSI	Central Line Associated Bloodstream Infection
CMAI	Christian Medical Association of India
CTD	Central TB Division
DGHP/GDD	Division of Global Health Protection/Global Disease Detection Regional Center
DGHT	Division of Global HIV and TB
DPH	Directorate of Public and Preventive Medicine
DRS	Drug Resistance Survey
DR TB	Drug-resistant Tuberculosis
DST	Drug Susceptibility Testing
EIS	Epidemic Intelligence Services
EOC	Emergency Operations Center
EQAS	External Quality Assurance Scheme
FEMA	United States Federal Emergency Management Agency
GHSA	Global Health Security Agenda
GLPGP	Global LPG Partnership
GoI	Government of India
HAI	Healthcare Associated Infection
HIV	Human Immunodeficiency Virus
HTC	HIV Testing and Counselling
IBBS	Integrated Biological and Behavioral Survey
ICMR	Indian Council of Medical Research
IDSP	Integrated Disease Surveillance Programme
IHR	International Health Regulations
IMS	Incident Management System
IPC	Infection Prevention Control
IQLS	Integrated Quality Laboratory Service
ISO	International Standards Organization
JE	Japanese Encephalitis
KFD	Kyasanur Forest Disease
LAIV	Live Attenuated Influenza Vaccine
LCI	Local Capacity Initiative
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
MDR TB	Multidrug-resistant Tuberculosis
MoHFW	India Ministry of Health and Family Welfare
MOU	Memorandum of Understanding
MR	Measles-Rubella
MTA	Mid-term Appraisal

NACO	National AIDS Control Organization
NACP	National AIDS Control Programme
NCDC	India National Centre for Disease Control
NGO	Nongovernmental Organization
NGS	Next Generation Sequencing
NIE	National Institute of Epidemiology
NIHFW	National Institute of Health and Family Welfare
NIMHANS	National Institute of Mental Health and Neurosciences
NIRT	National Institute of Research in Tuberculosis
NIV	National Institute of Virology
NIVEDI	National Institute of Veterinary Epidemiology and Disease Informatics
NLSI	National Laboratory Strengthening Initiative
NTF	National Task Force
NTI	National Tuberculosis Institute
NVBDCP	National Vector Borne Disease Control Programme
OSC	Opioid Substitution Center
OST	Opioid Substitution Therapy
PATH	A global health NGO
PEPFAR	President's Emergency Program For AIDS Relief
PHI	Public Health Institute
PI	Principal Investigator
PLHIV	People Living with HIV
PMTCT	Prevention of Mother to Child Transmission of HIV
POE	Port of Entry
PPTCT	Prevention of Parent to Child Transmission of HIV
PWID	People Who Inject Drugs
RNTCP	Revised National TB Control Programme
RRT	Rapid Response Team
RSV	Respiratory Syncytial Virus
SARI	Severe Acute Respiratory Infection
SEARO	Southeast Asia Regional Office
SEWA	Self-Employed Women's Association
SHARE	Society for Health Allied Research & Education
SHOC	Strategic Health Operations Center
SI	Strategic Information
SIMS	Strategic Information Management System
SOP	Standard Operating Procedure
STI	Sexually Transmitted Infection
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
TPT	Tuberculosis Preventive Therapy
UAV	Unmanned Aerial Vehicle
UNAIDS	United Nations Programme on HIV/AIDS
VHF	Viral Hemorrhagic Fever
VHS	Voluntary Health Services
WHO	World Health Organization

CDC PROJECTS IN INDIA

Jammu and Kashmir ▲

Himachal Pradesh

Chandigarh ▲

Haryana ▲

Punjab ▲ ●

Uttarakhand ■

Delhi ▲ ✖ ✚ ✚ ▲

Assam ▲ ● ✖ ✚ ▲

Arunachal Pradesh

Sikkim

Nagaland ● ◉

Rajasthan ✖ ■

Uttar Pradesh ▲ ✖ ■

Bihar ■

Meghalaya

Manipur ● ◉

Tripura ▲

Mizoram ● ◉

Gujarat ▲ ● ▲

Madhya Pradesh ● ✖ ■

Jharkhand ● ▲ ■

West Bengal ▲ ▲

Chhattisgarh ✖ ■

Odisha ▲ ✖ ✖ ■

Maharashtra ▲ ✖ ▲ ● ✚ ◆ ■ ▲

Telangana

Goa ▲

Karnataka ▲ ✖ ✚

Andhra Pradesh ▲ ● ◆ ■

Puducherry

Tamil Nadu ▲ ● ✖ ✚ ✚ ▲

Lakshadweep

Kerala ▲

Andaman and Nicobar Islands

Division of Global Health Protection (DGHP)/ Global Disease Detection (GDD)

▲ Surveillance

● Lab Strengthening

✖ Workforce Development

✚ Emergency Preparedness

Division of Global HIV and Tuberculosis (DGHT)

▲ Quality Management Systems in Blood Banks

● Lab Systems Strengthening

✖ Local Capacity Initiative (LCI)

✚ TB (focus)

◆ Prevention of Mother to Child Transmission of HIV (PMTCT)

■ India Care and Treatment Project

◉ Project Sunrise

▲ **Influenza Division**

▲ **Air Quality SEWA Project**

In addition to all state specific activities, CDC India provides technical assistance to national programs in such areas as development of guidelines, national policies, and training programs. These activities have countrywide reach.

GLOBAL HEALTH SECURITY AGENDA (GHSA)

"The world is more connected than in any time in human history. Distance no longer affords protection from disease, viruses, even epidemics."

CDC Director Dr. Tom Frieden, et al in *A Path to Global Health Security*

CLABSI Surveillance staff meeting at AIIMS.

Recognizing that a health threat anywhere is a health threat everywhere

In 2014, the United States government announced its intent to invest more than $1 billion in resources to expand GHSA–an initiative designed to make sure the world is ready to prevent, detect, and respond to future infectious disease outbreaks.

GHSA in India continues to build on the International Health Regulations (IHR), which provide guidance for countries to assess and manage serious health threats that have the potential to spread beyond borders. CDC's Division of Global Health Protection/ Global Disease Detection (DGHP/GDD) in India is focusing efforts on four of the 11 GHSA action packages (the "Core 4"), specifically increasing real-time surveillance of potential public health threats, strengthening laboratory systems, ensuring more health workers are well trained in detect, respond, and prevent capacities, and establishing Emergency Operations Centers (EOCs)/Strategic Health Operations Centers (SHOCs) with rapid response teams capable of activating a coordinated emergency response.

India is the largest of the Phase 1 GHSA countries, and also sits on the ten-country GHSA Steering Group, which has placed India and our CDC team in a unique position to lead and demonstrate successes of GHSA implementation. Drawing on extensive experience with infectious disease surveillance, emergency preparedness, public health workforce development, and laboratory strengthening, CDC India began working with India's MoHFW and other partners to support GHSA goals. Since 2015, the Government of India and other partners have received over $25 million to establish or expand existing GHSA projects. Already in just over one year and a half, we have seen significant public health impact of these activities, such as establishing 28 acute febrile illness (AFI) sites, providing diagnosis to nearly 40% of acute encephalitis syndrome patients, assessing 388 laboratories to develop action plans for improvement, and establishing a state-level EOC in Tamil Nadu.

CDC India is working to strengthen global health in India and around the world by focusing on four of GHSA's 11 Action Packages

Surveillance

◆ Conducting high-impact public health surveillance of disease syndromes such as acute febrile illness and acute encephalitis syndrome.

◆ Strengthening viral hemorrhagic fever and respiratory disease surveillance.

◆ Enhancing surveillance platforms to detect vaccine-preventable bacterial disease in young children.

◆ Supporting surveillance of healthcare associated infections and antimicrobial resistance.

Lab Strengthening

◆ Enhancing the quality and capacity of public health laboratories by supporting the National Laboratory Strengthening Initiative of the National Centre for Disease Control.

◆ This initiative strengthens the capacity of all district and state laboratories beginning in the states of Gujarat, Tamil Nadu, Jharkhand, and Madhya Pradesh.

◆ Implementing a district model of integrated lab services in the states of Rajasthan, Maharashtra, Telangana, Andhra Pradesh, West Bengal, and Assam through Labs for Life.

◆ Expanding laboratory-enhanced disease surveillance for improved outbreak response.

◆ Developing rapid diagnostic capabilities and whole genome sequencing methodology to be used for drug-resistant TB, and to diagnose known and unknown pathogens.

Workforce Development

◆ Strengthening national epidemiologic capacity through the India EIS program, three-month Frontline Epidemiology trainings, and Rapid Response Team trainings, including for veterinarians.

◆ Evaluating laboratories on techniques including for antimicrobial resistance, and hospital staff on infection control practices and healthcare-associated infection surveillance.

Emergency Preparedness

◆ Providing training for disaster response and mass casualty events.

◆ Supporting the national Indian Emergency Operations Centers (EOC)/Strategic Health Operations Centers (SHOC) with emergency response training and facilitating development of these centers at the state level.

Training laboratory staff in safe handling and rapid transportation of clinical specimens and of potentially infectious waste during public health emergencies. *GHSA*

Projects by State and Partner

STATES	PARTNERS WITH PROJECT IN STATE/UNION TERRITORY
Andhra Pradesh	CMAI
Assam	AIIMS, NCDC, NIMHANS, NIV, CMAI, Manipal
Goa	Manipal
Gujarat	NIV, NCDC, CMAI, Manipal
Jammu & Kashmir	NIV
Jharkhand	Manipal, NCDC
Karnataka	AIIMS, NIMHANS, Manipal, NCDC
Kerala	Manipal
Madhya Pradesh	NIV, NCDC
Maharashtra	AIIMS, NIV, CMAI, NCDC, Manipal, SHARE
Meghalaya	NIV
Odisha	NIV, Manipal, NIVEDI
Punjab	NCDC
Rajasthan	AIIMS, NIHFW, NCDC, NIV, CMAI
Tamil Nadu	AIIMS, NCDC, NIE, NIRT, NIV, PHI, Manipal, MoHFW
Telangana	AIIMS, CMAI
Tripura	Manipal
Uttar Pradesh	AIIMS, NIMHANS, NCDC, NIV
West Bengal	AIIMS, NIMHANS, NIV, CMAI

UNION TERRITORIES	
Andaman and Nicobar Islands	NIV
Chandigarh	AIIMS
Delhi	AIIMS, NIV, NCDC, MoHFW, WHO-I, WHO-SEARO
Puducherry	NCDC

DIVISION OF GLOBAL HEALTH PROTECTION (DGHP)/GLOBAL DISEASE DETECTION REGIONAL CENTER (GDD)

With GHSA as a central focus, the DGHP/GDD team works to build capacity within district, state, and national public health entities to rapidly detect, accurately identify, and promptly contain emerging infectious disease threats. DGHP/GDD is working across the country, in a total of 19 states and four union territories.

GHSA India partners in Atlanta.

Laboratory training at GHSA partner Manipal University.

⊙ Surveillance

Acute Febrile Illness (AFI)

Despite advances in laboratory diagnostics, there are still gaps in understanding the burden, etiologic spectrum, and risk factors associated with AFI in India. DGHP/GDD is collaborating with Manipal University and NIE to determine the specific causes of AFI and to recommend data-driven interventions to reduce illness and mortality.

The Manipal-DGHP/GDD collaboration, initiated in 2014, is currently being implemented in 28 select district and sub-district hospitals in 10 states as an ongoing surveillance activity, identifying previously-undiagnosed fever pathogens and providing new insights on the burden and geographical distribution of influenza, leptospirosis, scrub typhus, dengue, malaria, Kyasanur Forest Disease, and more than 70 other pathogens. The current 28 sites are in Karnataka, Kerala, Goa, Maharashtra, Assam, Gujrat, Jharkhand, Tamil Nadu, Tripura, and Odisha. These AFI data were utilized for reprioritization of diseases by IDSP, in a multisector exercise, in 2016. The increased lab capacity and rapid diagnostic turnaround time has had a significant impact on patients—with the ability to get lab-confirmed diagnoses in 24 hours, doctors are able to treat patients more quickly with the appropriate medicines, shortening hospital stays and improving clinical outcomes.

The NIE-DGHP/GDD collaboration is working to develop a Model Public Health District in Tiruvallur and other districts in Tamil Nadu. As part of this effort, NIE is strengthening facility-based surveillance of

three syndromes: ADD, AFI, and ARI (including severe ARI or SARI), specifically at the district hospital level. Key strategies being implemented include laboratory strengthening and establishing epidemiological parameters to allow for early detection of disease clusters and their etiology, improved understanding of disease burden and epidemiology, and evidence-based public health practice, including outbreak response. To date, 654 suspected patients have been enrolled and tested for more than 15 pathogens.

Acute Encephalitis Syndrome/ Japanese Encephalitis (AES/JE)

AES is a major public health problem in India that affects thousands of people every year. Approximately one in six cases of AES in India are due to JE. However, the causes of the majority of AES cases has been poorly understood. In June 2014, DGHP/ GDD and the National Institute of Mental Health and Neurosciences (NIMHANS) helped launch a tiered network for systematic laboratory-based surveillance of AES in highly-affected regions. The network collaborates closely with state and national health programs and supports district and referral laboratories to provide accurate and timely diagnosis of JE and other causes of AES. The collaboration has provided training to improve AES diagnostic capacity, enhance quality laboratory practices, implement a systematic diagnostic algorithm, and collect and report standardized epidemiologic data.

US Deputy Chief of Mission MaryKay Carlson, WHO Representative to India Dr. Henk Bekedam, Director General of Health Services Dr. Jagdish Prasad, Director General, Indian Council of Medical Research Dr. Soumya Swaminathan, Deputy Director General (TB) Dr. Sunil Khaparde and CDC India Director Dr. Kayla Laserson light a lamp at the opening of the 2016 GHSA Annual Review meeting.

Government of India leadership, WHO leadership, CDC India, and partners present the GHSA Annual Review Achievements Summary featuring activities and impact of the many GHSA partners working in India.

Through GHSA, the project helped establish consistent JE diagnostic testing capacity in eight districts linked with four quality-assured referral apex laboratories for additional testing. By 2016, systematic hospital-based AES surveillance was expanded to include a total of 15 districts linked with five apex laboratories. Results of surveillance are disseminated to treating clinicians and public health officials in a timely manner. Surveillance efforts have helped to provide a diagnosis to nearly 40% of AES patients, which is more than double the proportion of AES patients with a diagnosis than before this network was implemented.

Viral Hemorrhagic Fever (VHF) and Respiratory Virus (RV) surveillance

In the past decade, there have been sporadic outbreaks of VHF in India, particularly of Kyasanur Forest Disease, Crimean Congo Hemorrhagic Fever, and dengue. Furthermore, influenza and other respiratory diseases caused by viral pathogens remain a major public health concern in India. CDC DGHP/GDD is supporting National Institute of Virology (NIV), Pune to strengthen the capacity of two laboratory networks, (1) ten laboratories which effectively detect and respond to VHF pathogens; approximately 5,000 patients presenting with VHF-like symptoms have been tested in this network and (2) six laboratories which carry out epidemiological and virological surveillance for 18 respiratory viruses in the country, including influenza A and B, respiratory syncytial virus (RSV), human metapneumo virus, Para-influenza Viruses 1–4, Adenoviruses, Rhinovirus, and human corona viruses, and ensure pandemic preparedness.

Approximately 1,500 patients have been tested to date in this network. Of note, GHSA funds to the WHO Country Office are supporting work to bring the NIV respiratory virus network and National Centre for Disease Control (NCDC) led influenza network together. Both of these networks facilitate early detection of dangerous pathogen threats, and provide immediate support and rapid response in epidemics, outbreaks and emergence or reemergence of highly infectious pathogens.

A weekly reporting mechanism has been established to report the AES, AFI, VHF, and respiratory virus surveillance data from all GHSA partner institutions to all national health authorities, including IDSP and NVBDCP, for these authorities to take action. Current efforts of these platforms are focused on working with state and national officials to incorporate project findings into routine surveillance, including at the district level, and develop a template for sustainability.

Diarrheal Diseases

Acute diarrheal diseases (ADD) and food poisoning account for approximately 40% of reported disease outbreaks in India, but finding the source of the outbreak can be challenging. Through collaboration between DGHP/GDD and NCDC's IDSP, activities have been focused on strengthening all aspects of outbreak investigations, including building capacity for the pre-analytic components of lab work, developing a more systematic epidemiologic approach, and initiating routine ADD surveillance.

GHSA partners from the 17 Phase 1 countries meeting with Dr. Frieden and CDC headquarters and field staff in Atlanta.

Healthcare Associated Infections (HAIs) and Antimicrobial Resistance (AMR)

AMR is a critical global public health threat, and many hospitals in India lack the capacity to accurately detect resistance in key pathogens. Further, the country lacks a uniform system to implement IPC practices and surveillance for HAIs. As India has committed to the AMR target of GHSA, there is an urgent need to enhance the capacity of national and regional laboratories to accurately detect AMR pathogens, assess and strengthen IPC, and expand standardized surveillance of HAIs.

In 2015, the DGHP/GDD team began to work with MoHFW counterparts to leverage existing capacities in two national AMR surveillance networks to quantify, strengthen, and expand the ability of healthcare systems to generate and report accurate AMR data. Working with the ICMR and NCDC, the team has helped to assess IPC practices, initiated standardized HAI surveillance in 13 hospitals, and supported the development and implementation of targeted HAI prevention practices in these settings. Current efforts are focused on expanding these networks, helping to assess antimicrobial use, and starting an AMR laboratory external quality assurance scheme (EQAS) to improve the quality of AMR surveillance. The resulting data will ultimately help support better patient care, inform the development of antimicrobial stewardship policies, better reflect the magnitude of AMR threats affecting India, and guide further refinement of state and national plans to combat antimicrobial resistance. DGHP/GDD is also working closely with WHO on the development of India's National AMR Plan.

One Health

Recent outbreaks of zoonotic diseases such as anthrax, leptospirosis, and avian influenza in India continue to reinforce the need to collaborate with animal health experts to establish an interdisciplinary strategy for infectious diseases that have an impact on both humans and animals.

Within the context of those needs and the goals of the Global Health Security Agenda, DGHP/GDD has partnered with multiple institutions, including the NCDC, the National Institute of Epidemiology (NIE), the National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), and Manipal University to launch a One Health initiative. These partnerships aim to track, measure, and control emerging zoonotic diseases. In particular, DGHP/GDD, Manipal, NIVEDI, and NIE have teamed up to train veterinarians in field epidemiology and outbreak response. Further, DGHP/GDD has been working with these partners to gather a precise understanding of the prevalence and transmission dynamics of key zoonotic diseases in India such as anthrax, brucellosis, and leptospirosis. Also, through detecting and investigating reported human and animal anthrax outbreaks with the national and state IDSP and the National Animal Disease Expert Referral System, the project team has identified and conducted multiple outbreak investigations with the Jharkhand state government. These investigations serve as a model for future outbreak investigations.

The next steps for One Health activities include continuing to enhance epidemiologic capacity, evaluating AMR in animals, estimating the burden of zoonotic pathogens across the country, and helping our partners strengthen zoonotic disease surveillance and enhance public health capacity for control of zoonotic diseases.

Dr. Mohan Papanna conducting monitoring of an AFI center in Assam.

CDC country director Dr. Kayla Laserson signing the letter of agreement with Jharkhand State Government for an AFI site at Simdega—the site has been crucial for detection of, and response to, outbreaks of anthrax.

Informatics

In support of capacities to prepare for and respond to public health threats, informatics activities help enhance global health security through standards-based information management for improved decisions. DGHP/GDD is currently providing technical assistance to more rapidly detect and respond to outbreaks by optimizing data access and use, and improving data quality through design, development, and deployment of information systems. There are two projects with local partners in India.

The first is an Electronic Daily Fever Syndromic Surveillance System (eDFSS) in collaboration with NIE. This system, which is embedded within the GHSA Model Public Health District activities, will initially track fever cases in the Tiruvallur District of Tamil Nadu in 36 facilities: 11 government hospitals, 13 upgraded primary health centers, and 12 private clinics or hospitals. Fourteen health inspectors will collect data daily using this phone-based app. The data will be collected in a central Tamil Nadu Health Surveillance Data Warehouse for analysis and display on a dashboard accessible to decision makers at all levels of state and local government. This system will provide near real-time surveillance and early warning of fever-based syndromes for action by health authorities. Once the system is developed and implemented, it will be expanded to include the facility-based AFI surveillance and the events-based block/district surveillance currently being implemented.

The second project is an Electronic Acute Encephalitis Syndrome Surveillance System (eAESS) developed in collaboration with NIMHANS located in Bangalore.

This system will collect the data from the ongoing GHSA project of prospective hospital-based surveillance of AES. The system will collect data from approximately 1,000 subjects per year in at least seven states over five years. Both epidemiologic and laboratory data will be collected, entered, and analyzed in the system. The data will ultimately be used by the NVBDCP to inform public health action against the complex of diseases causing AES.

Through the GHSA platform, CDC is also collaborating with the WHO Country Office in strengthening IDSP informatics, including evaluating electronic database and visualization options.

Events-based Surveillance

Community and healthcare facility-based events-based surveillance is an important component of early warning systems that allows countries to detect and report outbreaks rapidly. The state of Tamil Nadu is implementing such an early warning surveillance system in the GHSA Model Public Health District with a novel SMS-based reporting system. Using this system, health volunteers in the community can text alert signals to the sub-district-level medical officers. Capacities for risk assessment when events are reported and appropriate response will also be strengthened. Lessons learned will help support revision of the community events-based surveillance components of the existing national disease surveillance system, the IDSP.

Union Minister of Health and Family Welfare, J.P. Nadda, inaugurates a national summit on combatting AMR.

Lab Strengthening

Lab Systems Strengthening

With support provided by CDC India, the NCDC launched the National Laboratory Strengthening Initiative (NLSI) in 2016. This initiative began with a sensitization and consensus meeting of the National Task Force (NTF) on laboratory systems and diagnostic improvement. The NTF was composed of in-country laboratory specialists from throughout India who were selected by the NCDC. The DGHP/GDD laboratory team has provided and will continue to provide direct significant technical and financial support for the planned state-to-state expansion of this plan and hopes to continue this support through its partners in the coming years.

This initiative began in the state of Gujarat, followed by Tamil Nadu, Jharkhand, and Madhya Pradesh. The first key step of the initiative is to perform a baseline assessment of government laboratory facilities of all districts in the state as well as the state public health laboratories. Gaps and resources identified from the assessment give insight into the underlying issues that can be addressed, improved, and communicated to all state health officials and laboratory leadership. This leads to an ownership plan that is consensually developed by each state task force to facilitate progress in a prioritized and strategic manner.

Expertise from the NCDC and CDC is then elicited by each state. Training selected from a repertoire of modules developed by the NTC can be customized to the needs of each region or state. After a year, a follow-up assessment using the same laboratory assessment tool (a tool modified from the WHO For Laboratory Assessment Tool (F-LAT)) used previously will be utilized again to measure the impact of the training program.

This initiative covers biochemistry, pathology, and microbiology laboratories of both district hospital labs and medical college reference labs, and the state public health reference laboratory of participating states. To date, 388 laboratories have been assessed and reports have been relayed to state health laboratory leadership in order to develop action plans for laboratory improvement efforts. CDC and the WHO Country Office are also collaborating on strengthening labs, including the implementation of a lab assessment tool for AMR labs.

Technical reviews of the laboratories performed in these pilot states identified important gaps and highlighted the fact that the laboratory sector at the district level requires strengthening and targeted basic training for all aspects of fast, standardized, reliable and quality-assured laboratory diagnostic testing.

To this end, DGHP/GDD, in collaboration with NCDC's NLSI, will perform state-wide baseline reviews and training of all district laboratories of the states. Strengthening the laboratory sector will also be coupled to CDC's recently-launched Frontline Epidemiology training program so that specific gaps of both the laboratory and epidemiological sectors can be addressed. Linking the laboratory and epidemiologic training efforts through shared training venues will strengthen understanding and coordination. Post-training assessments will evaluate progress and continue to identify particular training needs locally and fill gaps through ongoing customized trainings that are supported by the NCDC, state health officials, and CDC. The goal is to build infectious disease diagnostic and applied epidemiologic capacity at the district and state level, strengthen the network and coordination efforts, and expand both geographically and technically as needed in order to create a robust and responsive pathogen detection and response network.

Biorisk/biosecurity

CDC India provides technical support to the Government of India to build biorisk management (BRM) capacities in the public health laboratories of India. This is a two-pronged approach which involves:

- Developing a core group of trainers on BRM. To this end, two national-level BRM trainings (Training of Trainers) were organized at the NCDC to train identified biosafety/biosecurity officers. Further trainings are being planned with NIV and the NCDC to train additional experts in more states.

- Providing BRM trainings to district hospitals and state medical college laboratories. Under the NLSI, specific wet-lab trainings are being provided to the district hospital and state medical college microbiologists to ensure quality diagnosis and safe laboratory practices.

Workforce Development

India Epidemic Intelligence Service (EIS)

Recognizing a need to strengthen the range of comprehensive hands-on epidemiology training available, DGHP/GDD collaborated with the NCDC to launch the India EIS Program in 2012. Modeled after CDC's own EIS, the India EIS is a two-year training program focused on applied epidemiology that provides medical doctors a premiere learning experience through practical field experience.

Since its inception, the EIS program has graduated 24 EIS officers from three cohorts who have investigated over 80 outbreaks in 23 states. These officers have been involved in multiple investigations and projects of public health importance, including an investigation of acute encephalopathy syndrome in Bihar; the establishment of a burn registry system; a surveillance review of birth defects in southern India; and outbreak investigations of anthrax, Kyasanur Forest Disease, acute diarrheal diseases, hepatitis E, measles, and many other priority diseases.

CDC is working in collaboration with GoI to further expand the public health workforce, with a Public Health Workforce Strategy that builds upon the India EIS Program at the NCDC. The new strategy expands the 2-year India EIS Program into a regional model, including 2-year EIS hubs at the NCDC, National Institute of Epidemiology (EIS-South), and at least three more regional hubs, and 3-year EIS hubs at WHO (with the polio transition workforce) and at MoHFW, with the Central Health Service cadre.

Frontline Epidemiology Training

DGHP/GDD collaborated with NIHFW to launch Frontline Epidemiology training in March 2016. Frontline Epidemiology is a three-month training program for district officers in basic epidemiology, surveillance, and outbreak investigation. The training consists of three workshops interspersed with on the job surveillance system assessments and outbreak investigations to practice the skills learned during the training.

The Frontline Epidemiology training program was started in Rajasthan in 2016. All 33 districts in the state have been trained. Training participants have conducted surveillance system assessments in their districts related to malaria, dengue, ADD, measles, enteric fever, and acute respiratory infections. The participants have also led systematic outbreak investigations of cholera, viral hepatitis, ADD, dengue, and influenza A (H1N1).

The Government of India is now planning to expand this program across the country, with a goal of training all districts.

"EIS teaches not only the science but also the art of public health. It is all about making incremental changes towards the health of the populations we serve. Our classrooms were the villages, hospitals and communities where we helped investigate outbreaks. Personally, the program made me grow as a public health worker-it taught me to examine a problem critically, think constructively and most importantly: act purposefully."

Dr. Anoop Velayudhan
Public Health Specialist and graduate of the 2nd cohort of India EIS

Dr. Anoop Velayudhan inspects a water tank during a Shigella outbreak caused by contaminated water.

Rapid Response Team (RRT) Training

RRT training enhances health security by increasing emergency response capacity as well as the efficiency and effectiveness of the responses. NIHFW built upon existing RRT training modules developed by IDSP and trained 69 RRT members from 16 states in three different RRT trainings. This training strengthens state public health surveillance systems to detect and investigate outbreaks, respond to public health emergencies more effectively, and ultimately prevent public health threats. Currently, train the trainer modules are being developed to ensure continued RRT training throughout the country.

Public Health Management (PHM) Training

Improving the skills of healthcare providers in early recognition, investigation, and effective management of public health problems remains a priority. At the same time, strengthening competencies in PHM is critical for identifying, implementing, and monitoring impact of health programs. It is imperative to develop skills in data management, development of a health profile, planning evidence-based interventions, supervision, and monitoring and evaluation of public health programs. CDC is assisting NIHFW to develop and strengthen surveillance and response capacity at the state and district levels by developing the competencies of program managers through PHM training. The targets for this competency-based training are healthcare workers whose day-to-day tasks involve public health management including data management, and the planning, implementation, and monitoring of health activities. Forty four public health managers from 12 states have been trained in three different trainings which helped them to prepare district health profiles. The training also included advocacy, project/program management, budgeting and developing program implementation plans (PIPs) more effectively. Currently, train the trainer modules are being developed to ensure continued PHM training throughout the country.

Investigating an outbreak of gastroenteritis.

Dr. Ajith Ramayyan holds up his EIS diploma after the graduation ceremony at the NCDC.

Emergency Preparedness

Emergency Operations Center (EOC)/ Strategic Health Operations Center (SHOC)

Establishing an interconnected global network of Emergency Operations Centers/Strategic Health Operations Centers (EOCs/SHOCs) is one of the main strategic priorities of GHSA. Since 2012, DGHP/GDD has been providing support to the NCDC to develop capacity of their SHOC, which includes training manpower for daily operations of the SHOC, more timely activation by developing an incident management system (IMS), swiftly deploying RRTs, and increasing laboratory capacity and other infrastructure to ensure efficient outbreak detection and response.

Since beginning a collaboration with the NCDC, DGHP/GDD has continued to help the SHOC team build expertise and strengthen program infrastructure, including facilitating FEMA Incident Response Training for 18 EOC/SHOC staff members and sending two staff to a six-month Public Health Management Fellowship at CDC headquarters in Atlanta. Since the launch of the EOC/SHOC, the team, with technical assistance from DGHP/GDD and NCDC, has developed 47 SOPs and an Infectious Disease Outbreak plan. In the coming year, DGHP/GDD will continue to assist the NCDC and the Indian government in the creation and training of state-based SHOCs across India as well as an EOC/SHOC at MoHFW in Delhi.

State and district-level emergency preparedness

Through GHSA funding, NIE is working closely with Tamil Nadu's DPH to establish an EOC/SHOC at the state level in Chennai and one in the Tiruvallur district. Developing a Model GHSA State and District by establishing an interconnected network of EOCs/SHOCs will increase capacity to respond effectively to public health risks and emergencies of international concern and provide a streamlined notification process for the international community.

The state-level EOC will provide one central location for decision makers and key partners to meet and manage a public health emergency response and to rapidly share information. Tremendous progress has been made to enhance emergency preparedness capacity. A site for EOC at the state and another at the district have been identified, three staff recruited, and equipment is being procured. FEMA Incident Command System online trainings were facilitated for 13 EOC staff. CDC assisted DPH to integrate all public health data and information needed for executive response decisions and technical support with hands-on training provided to standardize response plans, create SOPs, plan for mass gathering events and prepare a roadmap for how DPH will use the state and district level EOCs and use the incident management system during an emergency response. A dashboard displaying routine and response surveillance data will be developed to have a common operating picture during an emergency response.

India EIS officer Dr. Mohan Papanna conducting interviews at a jaundice camp during an Hepatitis E outbreak in Ranchi.

FACES FROM THE FIELD
Dr. Mohan Papanna

Dr. Mohan Papanna, a 2013 India EIS graduate, focused on drug-resistant TB (DR TB) during his two years of studies and also conducted outbreak investigations of waterborne diseases, mumps, Hepatitis E, and acute encephalopathy syndrome. Those busy two years included a one-on-one mentoring session with then CDC Director Dr. Frieden during a trip to India. Dr. Frieden shared his own first-hand experience with DR TB with Dr. Papanna, who also received an award for his work on his evaluation of TB-HIV surveillance in Chennai, Tamil Nadu at the 8th TEPHINET Global Conference in Mexico 2015. Trained in Community Medicine, Dr. Papanna has a wide range of experience in community health and infectious diseases. Now employed by CDC India as a Public Health Specialist, Dr. Papanna focuses on AFI surveillance and One Health.

MASS GATHERINGS
Focus: Kumbh Mela

Large procession at the 2016 Ujjain Kumbh Mela.

CDC India's Dr. Rajeev Sharma meets with sadus in preparation for the Nasik Kumbh Mela.

Pilgrims bathe in the Shipra river during the Ujjain Kumbh Mela; bathing in the river is thought to cleanse a person of all sins.

A Kumbh Mela is a mass Hindu pilgrimage where millions of the faithful come to bathe in one of four sacred rivers. In 2016 a Kumbh Mela was held on the banks of the Shipra River in Ujjain, Madhya Pradesh. Extensive preparation, communication and cross sector cooperation kept everyone safe during this six-week religious gathering—a gathering that is larger than the Haj and the Olympics.

At each Kumbh Mela, millions of pilgrims build their own temporary metropolis of tents along a riverside, waiting their turn to take a dip in the holy waters behind the thousands of sadus, or holy men, who lead the procession to the river banks. Makeshift food stands abound, water and sanitation is rugged, and the constant crush of people is inescapable. It's loud, colorful, chaotic—and if you're one of the lucky devotees, a transcendent experience.

This enormous influx of people can pose many challenges for local health officials. Tragically, during the 2003 Kumbh Mela in Nasik, 39 pilgrims lost their lives. As the time grew near for the festival to return to Ujjain, organizers feared the potential for an even greater tragedy, like the stampede that killed thousands at the Hajj in 2015. So they reached out to CDC and the NCDC, who helped create a series of workshops to help teach the local workforce how to safely manage the masses. Covering everything from crisis management to mass casualty scenarios and basic first aid, they trained 750 people, who, in turn, trained thousands more. The Massachusetts Institute of Technology (MIT) and partners joined the effort, sharing a custom Kumbh Mela app to help pilgrims instantly report problems to the event organizers. Even the sadus were enlisted as a powerful communication channel to help keep the faithful safe.

Ports of Entry

The porous nature of international borders increases the potential for spread of a public health threat, such as transmission of infectious diseases, across administrative and political boundaries. Many past outbreaks in India were first reported in neighboring countries (e.g. Nipah virus in Bangladesh) before spreading to India. In order to strengthen the capacity of Points of Entry (POEs) to prevent, detect, and respond to public health threats, health surveillance systems as well as the integration of points of entry into those systems must be strengthened.

Land border crossings pose significant risk but are often overlooked. The International Health Division (IH) of the MoHFW is responsible for developing capacity at POEs, and MoHFW and WHO-SEARO have received GHSA funding to improve capacity at POEs. CDC is assisting both partners to conduct workshops to assess the capacity in the border districts of India. WHO-SEARO is conducting a regional meeting to do the same while also developing a mechanism for cross-border surveillance and for rapidly sharing public health information.

After this initial workshop at the national level and engaging regional countries, the expected outcomes include:

◆ Develop and administer a tool for assessing the status of cross border information exchange for public health purposes between India and neighboring countries.

◆ Develop or modify standard operating procedures for cross border information sharing, contact and outbreak investigations based on workshop/tabletop exercise.

◆ Develop a mechanism with bordering countries by signing an MOU or LOI for rapid data sharing, specimen sharing, and deploying RRTs across borders for rapid and timely public health action.

Border surveillance meeting; building capacity at ground crossings by establishing a border disease surveillance program.

DIVISION OF GLOBAL HIV AND TUBERCULOSIS

Over 2.1 million Indians are infected with HIV—constituting the third largest HIV epidemic in the world.

CDC India has been working on HIV prevention and control since 2001, and provides technical assistance and support to the MoHFW's NACO and the Central TB Division (CTD). With multiple collaborating implementing partners and locally employed staff stationed in Delhi, Hyderabad, and Mumbai, DGHT supports activities across the country designed to help prevent new HIV infections, strengthen laboratory services, increase access to prevention and treatment services and service quality for people living with HIV and/or TB. DGHT is working to accelerate these efforts in cluster districts (districts that have been identified as having high HIV burden and large unmet need in Maharashtra, Andhra Pradesh, and in the states of Manipur, Mizoram, and Nagaland in Northeastern India). CDC India and partners are also working to improve the diagnosis and programmatic management of DR TB.
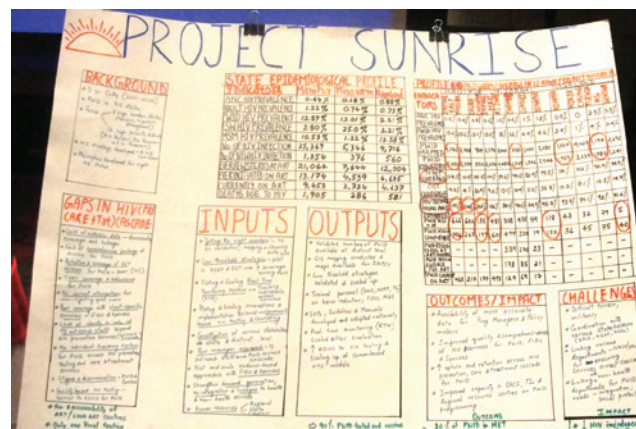
Project Sunrise

Despite success with outreach services, HIV prevalence continues to be high among People Who Inject Drugs (PWID) in the Northeast region of India, due in large part to the multiple barriers this population faces when trying to access the comprehensive package of services available.

To help address this growing epidemic, Project Sunrise was launched in February 2016 to support NACO's ongoing efforts to reach PWID with efficient and effective care, especially in high-burden districts of Manipur, Mizoram, and Nagaland. By working to scale up and improve the quality of services for the PWID population in these areas, DGHT hopes to eventually see a 30%-40% reduction in HIV incidence, a significant increase in the use of opioid substitution therapy (OST), and HIV-positive PWIDs receiving antiretroviral treatment (ART).

A "Rangoli" (flower decoration) created to mark World AIDS Day.

Poster from strategic partner meeting in Pune outlining Project Sunrise; government, community and CDC joining hands to develop a plan for HIV/AIDS response.

During the past year, the project has scaled up the response by implementing a mentoring program, supporting a comprehensive package of services for PWID, and supporting flexible clinic timing and take home dosing at Opioid Substitution Centers (OSC). The project also carried out training of a harm reduction force by sensitization of law enforcement officials, church members, and the general community to create a supportive environment in which the PWID community can access services. The project has also rolled out prison HIV interventions in these three states. The project directly engaged with the community who in turn mobilized the response. To illustrate, in one OSC the PWID community formed their own community-based organization and is supporting the OSC in increasing coverage and retention. Finally, the project launched an overdose helpline which has already saved scores of lives.

Quality Management Systems in Blood Banks

DGHT provides technical assistance to NACO to strengthen blood transfusion services in the country and to achieve its objectives of ensuring universal access to quality blood transfusion services and reducing transfusion-transmitted HIV infections to below 0.5%. In this endeavor, DGHT provides technical assistance to the National AIDS Control Programme (NACP) to establish a blood bank network across the country, conduct a nationwide assessment of all blood banks in both private and public sectors, scientifically estimate the national blood requirement, strengthen the capacities of blood bank staff through training, implement quality management systems including the EQAS, and review and develop blood transfusion services policies and guidelines.

DGHT also extends focused technical assistance in PEPFAR cluster districts. This assistance has led to an increase in case identification and linkage to the care continuum through strengthened referral of HIV seropositive donors and technology-based solutions for promotion of voluntary blood donation. These efforts have increased access to blood, increased the capability of blood bank personnel in quality management systems, and reduced the transmission of HIV through blood and blood products.

Laboratory Systems Strengthening

Previous phases of the NACP focused on scaling up HIV testing and related services. But in 2015 DGHT began working with NACO on Phase IV goals, which include ensuring higher quality diagnoses while also sustaining efforts to increase HIV testing coverage. Efforts have been focused on a cost-effective and mandatory EQAS as well as capacity-building initiatives, with the ultimate goal being International Standards Organization (ISO) accreditation. Concerted efforts have resulted in more than 50 percent of HIV referral labs achieving ISO accreditation so far.

DGHT has also been extending focused technical assistance in PEPFAR cluster districts to scale up quality standards at HIV Testing and Counselling (HTC) sites towards NACO certification. In addition, Labs for Life, a public-private partnership project, is extending technical assistance to develop ten model district laboratories in seven states in line with Indian Public Health Standards to provide integrated lab services. This initiative, in part funded through the Global Health Security Agenda, adopts a blended capacity-building approach and implementation of quality management systems which will ensure access to quality laboratory investigations for people living with HIV (PLHIV) who are on Pre-ART and ART treatments.

Launch of Prison Intervention Services in Manipur.

US Ambassador Richard Verma and Consul General Kolkata Craig L. Hall, along with DGHT and FHI 360 staff, visit the Manipur Network of Positive People, part of Project Sunrise, in Imphal.

Prevention of Mother to Child Transmission of HIV (PMTCT)

With the global target of eliminating new HIV infections among children, DGHT partnered with NACO to provide technical assistance and implementation support to Prevention of Mother to Child Transmission of HIV - referred to as Prevention of Parent to Child Transmission of HIV (PPTCT) in India. To help strengthen quality of PPTCT services for pregnant and breastfeeding female PLHIV and their exposed babies, NACO and DGHT along with WHO and implementing partner FHI 360 developed a web-based PLHIV ART Linkage System (PALS) software. PALS provides a PPTCT program dashboard at national, state, district and sub district levels that tracks all mother-baby pairs for providing PPTCT continuum of care services. PALS was successfully rolled out in more than 26 states and is planned to be implemented in all other states. Following this success, NACO with DGHT, WHO, and Voluntary Health Services (VHS) developed a module to capture information on all PLHIV in the country as part of HIV case reporting.

To provide quality PPTCT services that are stigma and discrimination-free to female PLHIV and their babies, NACO, DGHT, and FHI 360 developed training modules for labor room nurses on revised PPTCT guidelines and trained more than 137 nurses from nine states as master trainers. Using a cascade model, an additional 346 district-level labor room nurses were trained. At the cluster level in Maharashtra and Andhra Pradesh, health care providers, including labor room nurses, were trained on PPTCT. In Maharashtra, to strengthen the PPTCT services in urban areas, an innovatively-structured outreach program was launched where outreach workers were trained and posted in Mumbai.

Local Capacity Initiative (LCI)

NACO has scaled up the HIV/AIDS response throughout the country. While declining HIV trends are reported in southern states, some low prevalence states in the northern region are showing rising trends. NACO, being concerned with this trend, looked to augment the capacity of these northern states to scale up the response. Through the LCI project, NACO requested CDC to strengthen the institutional capacity of civil society organizations in the states of Chhattisgarh, Madhya Pradesh, and Odisha. NACO, CDC, and our implementing partner, the India HIV/AIDS Alliance, conducted a detailed analysis of the epidemiology and current program response in these states, and an implementation plan with innovative approaches has been developed to achieve accelerated epidemic control in these areas.

During 2016, the LCI project scaled up its response by putting in place a team of mentors drawn from the community. The mentors work with the community and the NGO in addressing barriers to accessing comprehensive HIV services.

The LCI project has also trained health care providers to provide stigma-free services to key populations.

By working to enhance the skills of outreach workers and health care providers, improving access to government social benefit schemes, and piloting other innovative, cost effective strategies, NACO and DGHT have started to see improvement in the ability of civil society organizations to advocate for improved access to HIV prevention, care, and treatment services, and ultimately reach underserved areas and populations.

DGHT Director Dr. Timothy Holtz and Consul General Hyderabad Ms. Katherine Hadda observe improving quality of blood bank labs in Telangana.

Lab strengthening efforts.

Technical Assistance to the National AIDS Control Programme (NACP)

CDC's Technical Assistance to NACP provides needs-based technical assistance to NACO in support of the fourth phase of the NACP (NACP IV). Partnering with VHS, DGHT works to maximize resources, address gaps in the HIV prevention, care, and treatment program, and assist with scaling up high-impact practices in the areas of prevention, care, and treatment.

This project has provided technical assistance to NACO by:

- Providing strategic, technical, and logistic assistance in conducting the Mid-Term Appraisal (MTA) of NACP IV, to review the progress made, and to document the achievements, opportunities, and challenges of the program with a view to sustain the HIV response in India.

- Advising and offering recommendations for the planning of NACP V in the context of the international UNAIDS strategy of 90-90-90 by 2020, the End AIDS by 2030 goal, and India's commitments to Sustainable Development Goals.

- Enhancing the capacity of 188 District AIDS Prevention and Control Units.

- Field testing the OST tools at the NACO-supported Punjab OST centers for accreditation as part of the OST program review.

Collaboration with Joint United Nations Programme on HIV/AIDS (UNAIDS)

UNAIDS, in collaboration with WHO and DGHT, reinforces national human resource capacities and provides technical support to NACO's Strategic Information Management System (SIMS). This support assists in generating and analyzing data to inform program decision making across the HIV cascade. Further, UNAIDS and DGHT provide assistance in developing national reports, supporting dissemination of the latest evidence to key stakeholders, and reinforcing technical discourse on information systems. Assistance is also provided on the use of information generated via surveillance, modelling and estimates exercises, and through periodic program data reporting systems.

The last year saw numerous achievements including finalization of 2015's HIV estimates on key indicators at the national level and across 35 states/union territories. A technical brief was prepared and key findings disseminated. Further, the latest evidence generated by the HIV estimates and Integrated Biological and Behavioral Survey (IBBS) have been analyzed and used as the basis to inform the NACP IV MTA executed by NACO, key partners and community-civil society representatives. The NACP IV MTA provided the basis to identify mid-course corrections to the program in the short term, and identify strategies for advancing towards fast-track targets in the medium term. Following a MTA recommendation, a national expert group consultation on surveillance and estimations was convened—with international experts from UNAIDS, WHO and CDC participating—to look at the strengths of India's surveillance system and how it can be reinforced to serve policy and program planning. Finally, support was provided to develop national reports which will be finalized and released by NACO in 2017, among them the 2014–15 IBBS transgender report, which will update district-level profiles and situation analyses.

Collaboration with the World Health Organization (WHO)

Since the project launched in 2012, DGHT staff have worked with WHO and NACO to facilitate the national implementation of the Strategic Information (SI)-related priorities of NACP IV. The team has helped develop

PPTCT training of labor room nurses at the district level.

A mentor interacts with community members in the Vidisha district of Madhya Pradesh.

operations and training materials for HIV sentinel surveillance in antenatal clinics, contributed to the planning of the IBBS, and helped revive a weak national information system. The WHO Country Office, in close collaboration with NACO and DGHT, provides technical assistance to the NACP on strengthening HIV information management systems and evidence-based policy making in India.

Since 2015, the project has supported PEPFAR's ambitious goal to end the HIV epidemic in the selected cluster districts of Andhra Pradesh and Maharashtra states. WHO conducted three workshops to build the capacity of state and district Monitoring and Evaluation (M&E) officials to use the national SIMS for day-to-day program monitoring and local decision making. The cluster district strategy aims to achieve the UNAIDS goal of 90-90-90 by 2020: 90% of PLHIV knowing their HIV status, 90% of those HIV-infected on ART, and 90% of those on treatment achieving virological suppression. The 90-90-90 targets are based on the recently published UNAIDS/WHO guidelines to End AIDS by 2030.

To monitor the 90-90-90 target cascade it is essential to strengthen the M&E system, improve data quality and use available evidence to improve the program response. The WHO Country Office recently organized a national workshop on data use for strategic planning. This was attended by state level M&E officers, state epidemiologists, and data managers to use data for strategic planning. This training also provided insights on state and to some extent district-level issues on data use and action.

Under the cluster strategy, WHO conducted visits, meetings and consultations with state-level officials on SI for HIV. WHO identified a number of issues such as parallel reporting, poor data quality, lack of rationalization of indicators at state and district levels and sub-optimal use of information to be addressed as top priorities.

WHO also contributed to the NACP IV MTA, under the aegis of NACO, and provided vital feedback for midcourse corrections.

Technical assistance to Sri Lanka

DGHT has proposed to facilitate bilateral knowledge transfer on HIV between India and Sri Lanka. DGHT, with partner VHS and National STD/AIDS Control Program (NSACP) officials, has undertaken a situational analysis in Sri Lanka and identified potential technical assistance areas including lab system strengthening and SI. The team made exploratory visits to various health care facilities. They also met with the Director General of Health Services, the Director of NSACP, team members of the Country Coordination Mechanism of the Global Fund, the

Family Planning Association of Sri Lanka, civil society organizations involved in prevention programs, experts and key stakeholders involved in HIV. The team's visit culminated in the completion of a project plan.

India Care and Treatment Project

Each year in India 110,000 people are estimated to be co-infected with HIV and TB, of which only 40% are diagnosed. Mortality among HIV-infected TB patients continues to be unacceptably high, primarily due to a late or missed diagnosis of either disease. In 2015, DGHT began providing technical support to NACO and strengthening key institutions to help address gaps in the coverage and quality of HIV-TB and HIV treatment services. CDC supported the Revised National TB Control Programme (RNTCP) and NACP in the rollout of single-window services through ART Centres for prevention and management of TB in PLHIV. These services include intensified case finding for TB with 4-symptom screening and fast-tracking, CBNAAT for PLHIV to ensure early diagnosis of TB and to identify rifampicin resistance, provision of Anti-TB Treatment (ATT), provision of TB Prevention Treatment (TPT) for prevention of TB in PLHIV, and AIC practices. CDC provided technical assistance in the development of guidelines, SOPs, and training modules. CDC also trained staff from 510 ART centers across the country on comprehensive guidelines on "Prevention and Management of TB in PLHIV at ART Centres." CDC also supported the RNTCP and NACP in a paradigm shift from intermittent treatment regimens to daily ATT for PLHIV and also the roll out of TPT for prevention of TB in PLHIV.

In the area of HIV treatment DGHT is working both at the national and cluster level. DGHT is working closely with NACO on the development of revised comprehensive technical and operational guidelines
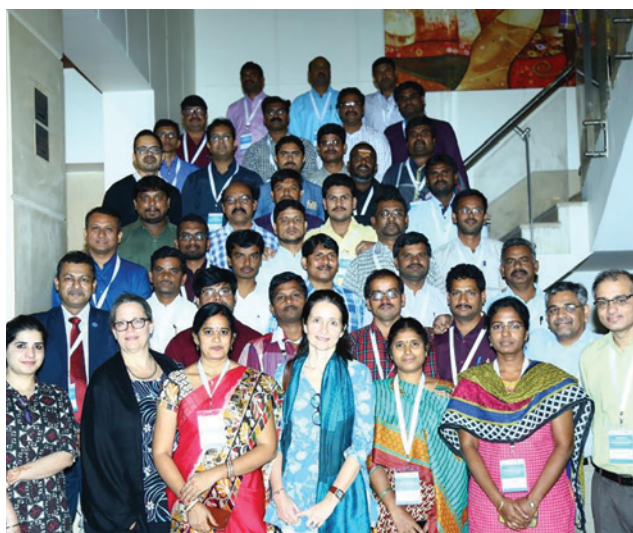
M&E workshop on data quality strengthening and indicators rationalization in Vijaywada, Andhra Pradesh.

to ensure quality services. At the cluster level, work is focused around improving the quality of care at ART centers and improving levels of retention in care. Another key area of emphasis is improving the quality of recording and reporting and ensuring that quality data is available for making necessary clinical and programmatic decisions.

TB Control in India

DGHT has provided technical assistance for TB control efforts in India since 1997 through a secondment agreement with WHO. In 2015, DGHT received direct funding for a medical officer dedicated to supporting the CTD within the MoHFW, including enhancing HIV-TB coordination. CDC India participated in the development of an ambitious National Strategic Plan for Tuberculosis Elimination, 2017–2025. This plan outlines all nationwide TB activities for the next eight years, and serves as the roadmap to reduce TB incidence by 10%–15% per year, culminating in one TB case per million persons in India by 2035. In alignment with this plan, CDC India is collaborating with the RNTCP to develop and strengthen a quality-assured laboratory network for accurate and reliable diagnostic testings, to strengthen surveillance systems to identify and target TB outbreaks and measure programmatic impact, to develop interventions to end TB transmission in the community and in health facilities, and to establish best practices for antituberculosis treatment adherence.

Preparing for the 'next generation'

As part of the GHSA platform, DGHT is collaborating with the National Institute of Research in Tuberculosis (NIRT) in Chennai to integrate next generation sequencing (NGS) into routine laboratory practice. NGS is a state-of-the-art technology that identifies antituberculosis drug resistance, and improves the ability to reliably detect TB transmission events. Data from NGS will support surveillance activities for the detection of outbreaks in the community and within heath facilities.

Improving adherence, achieving better outcomes, and preventing future cases

DGHT is supporting several initiatives to improve antituberculosis treatment and adherence. Treatment for TB involves multiple drugs that need to be taken for at least six months, with drug resistant cases requiring treatment for up to two years using more toxic and difficult to tolerate medications. In partnership with the National Institute of Tuberculosis and Respiratory Diseases (NITRD), DGHT is supporting a novel model of clinical tele-mentoring through Project ECHO.® Clinicians throughout several wards in New Delhi are linked to expert TB specialists via online virtual clinics, where they receive expert consultation support through case-based learning and guided practice to treat the most complex, multidrug resistant (MDR TB) patients in their own communities.

In Mumbai, the GHSA platform supports the partnership of CDC India with SHARE India and the Municipal Corporation of Greater Mumbai to mitigate MDR TB transmission and to improve treatment success rates (currently below 50%). Using a multidisciplinary approach, an innovative Airborne Infection Control Unit (AICU) composed of nurses, physicians, a microbiologist, and an architect has been established to assess, implement, and monitor infection control practices in more than 140 health care facilities in seven of the 24 wards in Mumbai. To improve treatment outcomes, adherence to medications must improve. CDC is partnering with SHARE India and the Tata Institute of Social Sciences

DGHT Director Dr. Timothy Holtz (far right) speaks at a conference focused on India's transgender communities.

to train, empower, and deploy a network of supervised counselors, as well as community-based volunteers to provide psychosocial support and counseling to patients newly diagnosed with DR TB, and to recognize common signs and symptoms of drug-related side effects. The counselors then link patients to medical providers for appropriate treatment of these side effects.

Bridging the gap between private and public sector service delivery

In 2015, 1.7 million TB cases were reported to the RNTCP and an additional 1.2 million patients were thought to have received treatment in India's private sector, remaining unrecognized by surveillance systems. To help bridge the gap between private and public sector service delivery, DGHT is establishing an additional agreement with SHARE India to create a mechanism for fee-for-service reimbursement of quality-assured laboratory services for private sector patients, including rapid molecular testing and full panel drug susceptibility testing (DST), at public sector rates. In addition, working with the NGO PATH, patients identified in the private sector will be linked with free-of-charge treatment for MDR TB, including reimbursement for consultation with specialist chest physicians in the seven wards where the adherence counselors are working.

Supporting the development and implementation of the first nationwide drug resistance survey

Ensuring effective management of TB requires mitigating the development of drug resistance. Surveillance of antituberculosis drug resistance is, therefore, an essential tool for monitoring program effectiveness. The RNTCP, in collaboration with the National Tuberculosis Institute (NTI), WHO, and DGHT, implemented the first nationally-representative antituberculosis drug resistance survey (DRS) in 2015–2016. One of the largest of its kind ever conducted, the Indian DRS processed nearly 10,000 sputum samples for culture and DST. The successful implementation of the DRS protocol has set the stage for routine national drug resistance surveillance. Results of this survey are pending, but are expected to establish a more accurate estimate of MDR TB globally, help evaluate current TB control interventions, rationalize DST-guided treatment modalities for new and previously treated cases, and assist in proper program planning and resource allocation for managing drug-resistant forms of TB across all health care sectors.
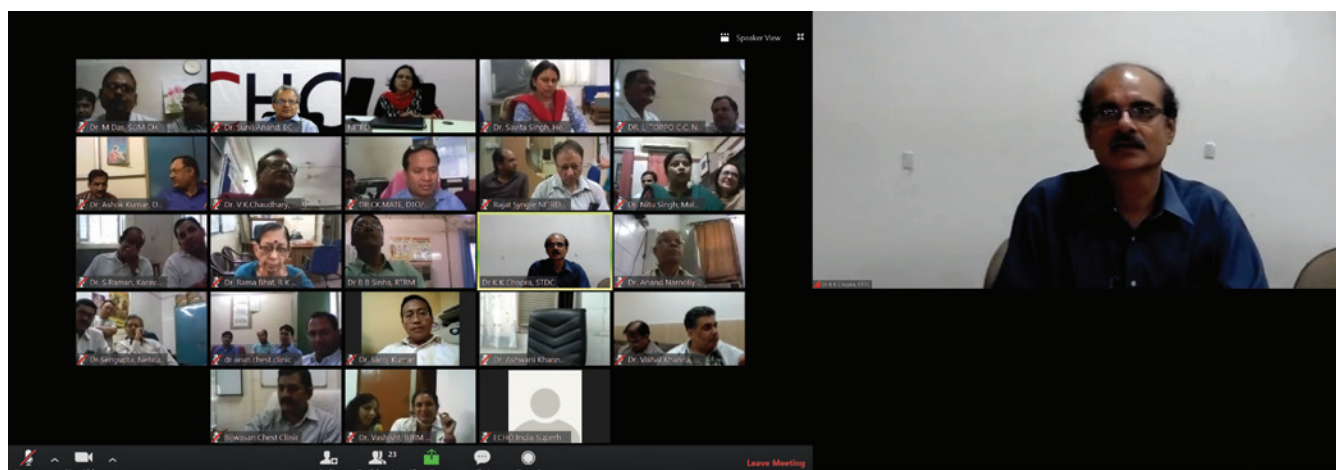
TB physicians in New Delhi interacting within an online virtual clinic of Project ECHO.®

Participants unite to END TB.

END TB posters on display in the Roosevelt House (Ambassador's Residence).

Both progress in the fight against TB and its survivors were lauded at an event held at the Ambassador's Residence in the US Embassy on March 7, 2016. Special guest Amitabh Bachchan, himself a TB survivor, presided over the evening which saw speeches from other survivors and highlights of the work being done to END TB.

"It is inspiring that India and the US are natural partners with a long history of collaboration on tuberculosis prevention, treatment, research and cure and I hope to continue to do my bit in this partnership to end tuberculosis in India."

—Amitabh Bachchan

CDC staff members Dr. Archana Beri and Ms. Deepika Joshi with Mr. Amitabh Bachchan who used his star power to spotlight the need for TB treatment.

US Ambassador Richard Verma shakes hands with special guest Amitabh Bachchan.

INFLUENZA PROGRAM

Since 2004, CDC India's Influenza Program has partnered with the MoHFW to support preparedness and response measures against seasonal, avian, and pandemic influenza in India.

The program aims to generate evidence to inform policy makers on influenza control and prevention strategies, while always working toward three main objectives:

- ◆ Public health research, to assess the burden due to influenza in terms of hospitalizations, deaths, and cost; to evaluate the direct and indirect effects of influenza vaccination among children; and to better understand the epidemiology of other respiratory pathogens causing acute respiratory infections in India.

- ◆ Building surveillance and lab capacity for the timely identification and characterization of viruses with pandemic potential, as well as efficient detection of seasonal influenza viruses, respiratory viruses, and novel emerging variants.

- ◆ Pandemic preparedness, response, and containment, including rapid response outbreak investigations, physician awareness, and respiratory infection control training.

In addition to working with MoHFW for a stronger surveillance network and improved regional response, CDC has been working closely with academic and research institutions to estimate the burden of influenza and other respiratory viruses in India. As part of GHSA efforts in India, the Influenza program worked closely with NIV to set up a multi-site enhanced sentinel surveillance network for common respiratory viruses including influenza and RSV. These surveillance sites help experts to understand

CDC flu staff Dr. Siddhartha Saha visits a village in Tamil Nadu for planning of community-based influenza surveillance.

Meeting of CDC staff with officials of the Registrar General of India for influenza-associated mortality estimation.

the proportion of burden due to different respiratory pathogens in different population groups as well as their seasonality. In the past, such surveillance helped in identifying the most effective influenza vaccine types and vaccination timing for particular regions of India. The Central Drug Standards and Control Organization agreed with these measures and adjusted the strain of vaccine and timing of vaccination accordingly. In addition, several hospital and community-based studies are underway to study the burden due to different respiratory pathogens among children and older adults- two of the most susceptible populations for pneumonia and other respiratory infections. These two age groups contribute significantly to the morbidity and mortality burden due to respiratory infections. The Influenza program has also been partnering with AIIMS, New Delhi to conduct large multi-year community-based vaccine studies in children involving the two main types of influenza vaccines available in India-live attenuated and inactivated influenza vaccines. The results of these studies are expected to inform policy makers of the burden of influenza in the community and effectiveness of available vaccines.

CDC flu staff Dr. Siddhartha Saha visits a virology lab in Nagpur, Maharashtra involved in influenza sentinel surveillance.

FACES FROM THE FIELD
Dr. Ritvik Amarchand, Scientist, AIIMS

Dr. Ritvik Amarchand supports Professor Anand Krishnan at the Center for Community Medicine at AIIMS. He has been associated with CDC-supported research cooperative agreements (CoAgs) for over five years. He has been the lynchpin of various studies under the AIIMS CoAgs by coordinating all ethical clearances, planning for annual budgets, managing funds, coordinating with field staff, and working closely with other departments at AIIMS to ensure the studies are conducted smoothly. He always has a smile on his face and even makes others laugh; it is because of this that he is approached by all the project staff with issues for solution. Dr. Amarchand exemplifies not only the best scientific principles but also warm Indian hospitality by ensuring overseas visitors enjoy the best local food and tea.

Going into details: Dr. Ritvik makes sure that vaccine allocation codes are kept in the right envelopes for a vaccine study.

STORIES FROM THE FIELD
Live Attenuated Influenza Vaccine (LAIV) study, Ballabgarh, Haryana

In 2016 CDC, in collaboration with AIIMS, New Delhi, conducted vaccination camps as part of the community-based vaccine study comparing the effectiveness of two types of influenza vaccines available in India- the live attenuated and inactivated influenza vaccines. This was the second year of the study which made this the first such randomized trial globally studying the effectiveness of the LAIV for more than one year. The study was conducted in six villages of the Ballabgarh sub-district of Faridabad in Haryana. The work for these camps started with the months-long job of seeking ethical and regulatory approvals from various offices in the Government of India and then taking informed consent from all study families recorded on video. Once all approvals were in place, the next challenge was to vaccinate the children in the hot summer months before the influenza season peaks during the monsoon season while still maintaining the vaccines at a cold temperature to prevent loss of their potency. The solution was to vaccinate the children during early morning hours before the day gets hot. However, to do that, the vaccination team members had to leave their homes at 4:00 am to reach the villages by 6:00 am with the required doses of vaccines in temperature-monitored ice boxes, list of children, various recording forms and other logistics to set up the camps. The camps were conducted over two weeks in different villages and reached over 3,000 children. The results from this study will inform scientists, public health specialists and policy makers in India and all over the world on future use of the LAIV in children.

Preparing influenza vaccine for administration.

A child is given a follow-up check after receiving the influenza vaccine.

Children are registered for the LAIV study.

Administration of LAIV.

NONCOMMUNICABLE DISEASES

Expanding Cooperation in the Health Sector

The opportunities for public health collaboration in India stretch beyond the realm of infectious disease, and CDC has been working closely with partners in the areas of environmental and occupational health. On June 25 2015, several Memoranda of Understanding were signed between US and Indian officials, including the MOU on Environmental and Occupational Health and Injury Prevention and Control to renew and expand bilateral cooperation on a broad range of important public health issues including household and ambient air pollution, chemical exposures, road safety, and improving public health surveillance. The recent renewal of this MOU has already helped spur important new work between CDC India and our local partners.

Self-Employed Women's Association (SEWA)—LPG Clean Cooking Project

Roughly 40% of the global population relies on burning solid fuels (usually biomass) in their homes to meet their most basic energy needs for cooking. The resulting indoor air pollution has not only local and global environmental impacts but also social impacts (e.g. on women's time). A large portion of that global population lacking access to better cooking fuels and technologies resides in rural India. The Indian government has launched a program to significantly expand access to cleaner LPG. However, that program does not target all of the households using solid fuels, does not consist of a grassroots promotional campaign to help households make the transition to different cooking fuels, and does not remove all of the logistical and financial barriers to increasing access. SEWA, a large trade union for women in the informal sector, along with the Global LPG Partnership (GLPGP) and CDC, is seeking to overcome some of these deficiencies through its own campaign in rural India to increase LPG adoption.

SEWA, with GLPGP and CDC support, is engaged in an education and promotion campaign to increase adoption of LPG among all rural households. CDC supports implementation of this project as part of a larger, global effort to advance the understanding of the barriers to scaling up LPG for cooking from initial uptake to exclusive and sustained use. CDC is contributing to the evaluation of the project's impact by monitoring and analyzing ambient air pollution levels as well as tracking and analyzing household level pollution indicators.

A SEWA worker interviews a woman about the barriers to adopting LPG in Rampara village, Gujarat.

Burn Registry

Burn injuries are a major public health problem in India and the annual incidence of burn injuries and deaths associated with burns is not routinely measured. Judicious extrapolation suggests that globally, on average, 7 million burn injuries occur every year, out of which 150,000 die and 250,000 are left severely disabled. In the absence of a central burn surveillance or registry system in India, the exact number of burn cases, their causes and the gaps in management are not known. To address this, CDC supported the Directorate General of Health Services, MoHFW in conducting a two-day stakeholders meeting on November 1-2, 2016 to deliberate and finalize specific modalities to establish a burn registry in India. The meeting facilitated knowledge sharing of the best practices for the burn registry and developed a standardized reporting format for the implementation of a burn registry in India.

Air Quality, Weather, and Health

Illnesses due to air pollution and extremes of weather have emerged as a major public health problem but are yet under recognized in India. Globally, air pollution—both indoor and outdoor—caused nearly 7 million deaths, or 11.6% of deaths in 2012, making it the world's largest single environmental health threat. In India, an estimated 1.5 million people died from the effects of air pollution in 2012. The resultant morbidity and mortality is difficult to determine because of a lack of central health surveillance or a registry system for illnesses due to air pollution and weather change in India. CDC supported the Centre

for Environmental and Occupational Health (CEOH) at NCDC in successfully conducting a two-day workshop on "Building the bridge between Air Quality, Weather and Health in India" November 7–8, 2016. Attendees from NGOS, Universities (both in India and abroad), and government agencies shared their knowledge on this problem of critical importance. A roadmap was established to develop a surveillance system that triangulates data of health related events with weather and air quality in coordination with the Ministry of Health and Family Welfare, Central Pollution Control Board, and Indian Metrological Department, Ministry of Earth Sciences. The urgent need to collect data on morbidity and mortality of air-pollution related illnesses from hospital emergency rooms has been recognized and a data collection system is planned.

Use of drones to measure air quality

Small Unmanned Aerial Vehicles (UAVs) or "drones" equipped with Particle and Temperature Sensors (PATS) have been introduced for in-situ air quality monitoring, as they can offer new approaches and research opportunities in air pollution and emission monitoring, as well as for studying atmospheric trends, such as climate change, while ensuring urban and industrial air safety. The drones use software that is capable of measuring various gases in the air as well as create pollution maps. Environmental regulators want to increase the use of drones in watching pollution levels to supplement the existing monitoring system in India.

A village woman makes roti on a traditional chulha in rural India.

Preparing a drone for ambient air pollution monitoring in Haryana.

IMMUNIZATION

Since 1993, CDC has assigned experts to both the WHO regional office (overseeing immunization-related activities in India and 10 other countries) and the WHO Country Office to support the surveillance and control of vaccine-preventable diseases. CDC's technical support and leadership has been instrumental in developing and implementing polio eradication strategies, strengthening the national immunization program, supporting accelerated control of measles and rubella, and supporting maternal and neonatal tetanus elimination strategies. Increasing routine measles vaccine coverage is one of the 11 GHSA action packages and CDC India awarded Global Health Security funds to the WHO Country Office to provide additional support to strengthen laboratory-based measles-rubella (MR) surveillance, starting with the launch of case-based MR surveillance in the states of Karnataka and Tamil Nadu. Furthermore, GHSA funds are helping to strengthen the MR laboratory network for expansion, and assisting with the transition from outbreak detection to case-based MR surveillance. A large MR vaccination campaign is planned for the first quarter 2017. Additionally, CDC India and WHO are collaborating to provide increased capacity building of the National Polio Surveillance Program leadership and surveillance officers, through the 3-year India EIS training program at WHO, as part of the larger Public Health Workforce Strategy. The WHO EIS hub will also support and strengthen the Integrated Disease Surveillance Programme (IDSP) platform at the national and state levels.

Children hold up their vaccination cards in the state of Uttar Pradesh.

MEET OUR STAFF

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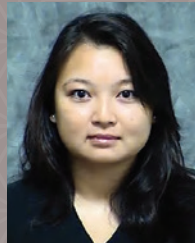Director,
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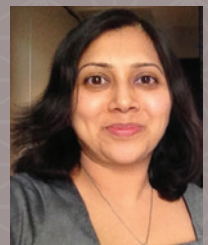DGHP/GDD

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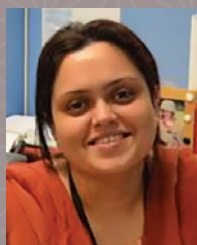Lab Branch Chief

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